

Training Package	Metal and Engineering (MEM05)			HSC Requirements and Advice
Title	Perform computations			
Unit code	Competency field	Band	Unit weight	HSC Indicative Hours
MEM12024A	Measurement	A	3	20

Unit descriptor	This unit covers estimating approximate answers to arithmetical problems, carrying out basic calculations involving percentages and proportions, and determining simple ratios and averages. The unit includes producing and interpreting simple charts and graphs.
Prerequisites	Nil
Application of the competency	This unit applies in manufacturing, engineering or related environments. It includes the application of the four rules of algebraic expressions, extracting information from drawings, diagrams, graphs and charts and producing simple charts and graphs. Data may be derived from readings taken or may be computer generated. Applications can include computations associated with pressure, volume, temperature, heat, speed, power, elasticity, density, mass, force etc. Calculations may be performed using pen and paper or on a calculator.
Related units	None

Evidence Guide

The evidence guide specifies the evidence required to demonstrate achievement in the unit of competency as a whole. It must be read in conjunction with the unit descriptor, performance criteria, range statement and the assessment guidelines for the Metal and Engineering Training Package.

Overview of assessment requirements	Context of assessment	Interdependent assessment	Method of assessment
A person who demonstrates competency in this unit must be able to perform computations.	This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.	This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with performing computations or other units requiring the exercise of the skills and knowledge covered by this unit.	Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Evidence Guide cont/d			HSC Requirements and Advice
Consistency of performance	Required skills	Required knowledge	Key Terms and Concepts
Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.	<p>Look for evidence that confirms skills in:</p> <ul style="list-style-type: none"> performing calculations involving whole numbers using all four basic rules performing calculations involving length, perimeter, area and volume checking calculated answers for accuracy rounding off estimated answers expressing information presented in fractional or decimal format as a percentage selecting appropriate formulae for the given application substituting the correct values for each term in the relevant formulae using appropriate mathematical operations performing calculations involving ratios or proportions determining required information from appropriate charts or graphs producing simple charts or graphs from given information or observations made selecting appropriate scales and using them in the production of charts and graphs marking appropriate limits clearly on the graph or chart reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents planning and sequencing operations checking and clarifying task related information checking for conformance to specifications undertaking numerical operations, geometry and calculations/formulae within the scope of this unit. 	<p>Look for evidence that confirms knowledge of:</p> <ul style="list-style-type: none"> formula applicable to the determination of perimeter, area and volume of simple geometric shapes techniques for estimating approximate answers reasons for using dimensions with the same units when calculating length, perimeter, area and volume concepts of perimeter, area and volume procedures for rounding off figures when estimating approximate answers mixed numbers, decimals, fractions and whole numbers concept of percentage procedures to be followed in converting a decimal to a percentage procedures for carrying out calculations involving fractions and using each of the four basic rules procedures to be followed on converting a fraction to a percentage sources of appropriate formulae reasons for ensuring that the units of each term are consistent with the formulae selected procedures for converting given units to those required for use in formulae concepts of ratio and proportion given ratios and proportions can be expressed in terms of whole numbers, fractions and decimal fractions scales applicable to the axes of the graphs or charts three types of charts and/or graphs used in the individual's field of work where appropriate, upper and lower limits of acceptability applicable to data 	<ul style="list-style-type: none"> addition, subtraction, multiplication and division calculation method checking and recording calculations converting units data decimals, fractions and percentages dimensions estimation extracting data/information imperial metric obtaining, understanding and clarifying instructions/procedures perform calculations perimeter, area and volume production of charts and graphs from given information proportion and ratio 'rounding off' safe work practices and procedures source, select and apply mathematical formulae substitution of correct values trends units of measurement whole and mixed numbers work instructions and procedures workplace documentation.

		Required knowledge cont/d	
		<p>entered on a graph or chart</p> <ul style="list-style-type: none"> • where appropriate, the trends indicated by the slope or gradient of a graph • where appropriate, the action to be taken when given trends occur or set limits are approached on graphs or charts • procedures for drawing 'lines of best fit' • the trends indicated by the graphs or charts drawn • hazards and control measures associated with performing computations, including housekeeping • safe work practices and procedures. 	

Elements	Performance criteria	Range Statement	HSC Requirements and Advice
1 Determine work requirement	1.1 Required outcomes are established from job instructions.	<p>The range statement provides information about the context in which the unit of competency is carried out. The variables [in bold] and scope [dot points] cater for different work requirements, work practices and knowledge between States, Territories and the Commonwealth, and between organisations and workplaces. The range statement relates to the unit as a whole and provides a focus for assessment. Text in italics in the performance criteria is explained here.</p> <p>The following variables may be present and <i>may include</i>, but are not limited to, the examples listed under the scope. All work is undertaken to relevant legislative requirements, where applicable.</p>	<p>Learning experiences for the HSC must address:</p> <p>A range of sources for work instructions and procedures including:</p> <ul style="list-style-type: none"> • work schedules • job card/sheet/plans/specifications • standard operating procedures (SOP) • standard operation sheets • Material Safety Data Sheets (MSDS) • diagrams/sketches • regulations/legislation • manufacturer/workplace guidelines, policies and procedures • Australian Standards. <p>Strategies for obtaining, understanding and clarifying instructions/procedures and specifications for task outcomes including:</p> <ul style="list-style-type: none"> • correct sourcing and selection of information • consult appropriate personnel • active listening • open and closed questions. <p>An awareness of safe work practices and procedures for a workplace within the manufacturing, engineering and related services industries.</p>
	1.2 Data is obtained from <i>relevant sources</i> and interpreted correctly.	<p>Relevant sources</p> <ul style="list-style-type: none"> • charts, graphs, diagrams, measurement data, reference manuals and specifications. 	<p>Learning experiences for the HSC must address:</p> <p>An awareness of the two common systems of measurement used in the manufacturing, engineering and related services industries:</p> <ul style="list-style-type: none"> • metric • imperial. <p>An understanding of:</p> <ul style="list-style-type: none"> • scales (in relation to charts/graphs) • estimations • tolerances • ‘rounding off’ • project quality requirements • waste minimisation.

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	<p>1.3 Required calculation method is determined to suit the <i>application</i>, including selection of relevant <i>arithmetic operations</i> and/or formulae.</p>	<p>Application</p> <ul style="list-style-type: none"> • applications can include computations associated with pressure, volume, temperature, heat, speed, power, elasticity, density, mass, force, etc. <p>Arithmetic operations</p> <ul style="list-style-type: none"> • application of subtraction, addition, multiplication and division • manipulation of decimals, fractions and mixed numbers and whole numbers • determining of percentages • performing of algebraic expressions • calculation of proportions and ratios. 	<p>Extracting data/information from a range of relevant sources including:</p> <ul style="list-style-type: none"> • drawings • diagrams • graphs • charts • measurement data • reference manuals • specifications. <p>Learning experiences for the HSC must address:</p> <p>A basic understanding of the mathematical concepts:</p> <ul style="list-style-type: none"> • whole numbers • mixed numbers • perimeter • area • volume • percentages • decimal • fractions • ratio • proportions. <p>Units of measurement for:</p> <ul style="list-style-type: none"> • length • pressure • volume • temperature • area • angle • velocity • mass • force. <p>An understanding of the reasons for:</p> <ul style="list-style-type: none"> • using dimensions with the same units when calculating <ul style="list-style-type: none"> - length - perimeter - area - volume
			<ul style="list-style-type: none"> • ensuring the units of each term are consistent with

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			<p>the formulae selected.</p> <p>Application of the four basic arithmetic operations:</p> <ul style="list-style-type: none"> • addition • subtraction • multiplication • division. <p>Manipulation of:</p> <ul style="list-style-type: none"> • whole numbers • mixed numbers • decimals • fractions. <p>Determining percentages.</p> <p>Conversion of:</p> <ul style="list-style-type: none"> • decimals and fractions to percentages • percentages to decimals and fractions. <p>Calculation of proportions, ratios and averages.</p> <p>Determining perimeter and area of:</p> <ul style="list-style-type: none"> • circle • square • rectangle • triangle • trapezium. <p>Determining volume of:</p> <ul style="list-style-type: none"> • cube • cone • cylinder. <p>Calculations involving regular and irregular geometric shapes found work tasks.</p> <p>How to source appropriate formulae.</p> <p>Application of mathematical formulae.</p>
			<p>Procedures for converting given units to those required for use in formulae.</p>

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	1.4 Expected results are estimated, including rounding off, as appropriate.		<p>Substitution of correct values for each term in the relevant formulae.</p> <p>Identification and selection of appropriate methods to perform a range of calculations suitable for the application/task in the manufacturing, engineering and related services industry.</p> <p>Learning experiences for the HSC must address:</p> <p>Techniques for estimating approximate answers.</p> <p>Procedures for ‘rounding off’ figures when estimating approximate answers.</p>
2 Perform calculations	2.1 Calculation method is applied correctly.		<p>Learning experiences for the HSC must address:</p> <p>Performance of calculations using:</p> <ul style="list-style-type: none"> • pen and paper • a calculator. <p>Calculations for a range of tasks/projects of varying complexity.</p>
	2.2 Correct answer is obtained.		<p>Learning experiences for the HSC must address:</p> <p>An awareness of the consequences of incorrect calculations for:</p> <ul style="list-style-type: none"> • the client • the organisation/company • the environment.
	2.3 Answer is checked against estimation.		<p>Learning experiences for the HSC must address:</p> <p>The importance of checking calculations.</p> <p>Recording calculations.</p> <p>The importance of recording information that is:</p> <ul style="list-style-type: none"> • clear
			<ul style="list-style-type: none"> • legible • accurate • concise

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			<ul style="list-style-type: none"> • appropriate in terms of industry terminology and abbreviations. <p>Documentation typical to the workplace for recording task/project calculations.</p>
3 Produce <i>charts and graphs</i> from given information	3.1 Data is transposed accurately to produce charts or graphs.	Charts and graphs <ul style="list-style-type: none"> • simple histograms, control charts, pie charts, etc. 	<p>Learning experiences for the HSC must address:</p> <p>A range of simple charts and graphs including:</p> <ul style="list-style-type: none"> • histogram • charts: <ul style="list-style-type: none"> - control - pie • graphs: <ul style="list-style-type: none"> - line - column. <p>Scales applicable to the axes of the charts/graphs.</p> <p>The importance of:</p> <ul style="list-style-type: none"> • appropriate and correctly labelled axes • clear and accurately marked coordinates • clearly marked, appropriate limits. <p>Application of a minimum of three types of simple charts and/or graphs used in manufacturing, engineering and related services industries.</p>
	3.2 Charts or graphs accurately reflect data on which they are based.		<p>Learning experiences for the HSC must address:</p> <p>An awareness of:</p> <ul style="list-style-type: none"> • upper and lower limits of acceptability applicable to data • the trends indicated by the slope or gradient of a graph • the actions to be taken when given trends occur or set limits are approached on charts/graphs. <p>Procedures for drawing ‘lines of best fit’.</p>